Environment of Care

Basics of Infection Prevention
2-Day Mini-Course
October-November 2011

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Objectives

- Describe the relationship between the healthcare environment and infection prevention
- Identify key systems and practices that contribute to infection prevention
- Identify practices to reduce the risk of environmentally-related healthcare-associated infections

Role of Hospital Surfaces in HAI

- 20-40% HAI are due to cross infection via hands of HCW
  - Pathogens survive for prolonged periods on hospital surfaces
  - Can contaminate hands
- Surface contamination plays an important role in transmission
  - Well-established for MRSA and VRE
  - New evidence for norovirus, *C difficile*, and Acinetobacter spp.
- Extent of patient-to-patient transmission found to be proportional to the level of environmental contamination

Weber DJ, Rutala WA, Miller MB, Huslage K, Sickbert-Bennett E. Role of hospital surfaces in the transmission of emerging health care-associated pathogens: norovirus, Clostridium difficile, and Acinetobacter species. Am J Infect Control. 2010 Jun;38(5 Suppl 1):S25-33.

Environment of Care (EOC)

Maintaining a high quality EOC involves many departments and disciplines

- Facilities Engineering
- Bio-Medical/Clinical Engineering
- Safety
- Environmental services
- Linen / laundry
- Construction
- Human Resources
- Materials Management
- Sterile Processing
- Employee Health
- Nursing
- Surgery
- Physicians
- Security
- Administration

Ad hoc EOC Committee members often include Quality, Licensing, Risk Management, Admitting, Patient Safety, and Dietary/Food departments.

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EOC Contributions to Infection Prevention

- Appropriate use of cleaners and disinfectants
- Maintenance of medical equipment
- Maintain water quality
  - Hemodialysis
  - Facility-wide
- Maintain ventilation standards
  - Airborne infectious isolation rooms
  - Operating rooms
- Support worker safety
- Manage water intrusion, flood response
- Mold remediation
- Construction and renovation

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Environmental Assessment

- Tour all areas at least annually
- Tour clinical areas twice a year
- Opportunity for multidisciplinary, multifunctional, multipurpose inspection
  - Life Safety
  - Environmental Services effectiveness
  - Infection Control issues
  - Clinical Issues
  - Patient Safety
  - Utility Management
- Required for accreditation by TJC

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Environmental Assessment - 2

How ?

Look for

- Use of only EPA-registered hospital-approved disinfectants
- Standard and transmission-based precautions followed as appropriate
- Regular cleaning and dusting (high and low)
- EVS carts kept clean and locked when unattended

EPA = Environmental Protection Agency
EVS = Environmental Services

Environmental Assessment - 3

- Sharps containers
  - Placed appropriately, i.e not too high, not directly under glove box or electrical outlet
  - Secured
  - Changed when ¾ full
  - Replaced regularly
  - User friendly
  - Safety devices accessed prior to disposal

EPA = Environmental Protection Agency
EVS = Environmental Services

Environmental Assessment - 4

- Medical (Biohazardous) waste
  - In covered leak proof container with biohazard symbol
  - Stored separately from other waste, in red bags
  - Contains sharps containers, pharmaceutical waste, pathology waste
  - Not stored on site for longer than 7 days
    - 90 days if stored at 0° C, temperature log required
  - High heat treatment prior to disposal or incineration

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Environmental Assessment - 5

- Hand hygiene areas
  - Adequate in number and evidence of use
  - Have soap/antimicrobial soap, paper towels, trash cans
  - Alcohol hand rub at or near appropriate room entrances and in patient rooms
  - Placement of alcohol-based hand rubs dispensers in compliance with fire code
    - See www.nfpa.org www.ashe.org
    - Seek assistance from Facilities Engineering or Safety Officer

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Environmental Assessment - 6

- Medical equipment reprocessing
  - Cleaning, decontamination, disinfection and sterilization
  - Staff training/competency/certification
  - Quality control, i.e. biological indicators, test strip, time logs
  - Appropriate area to reprocess equipment
    - Separate areas for cleaning and decontamination, packaging, sterilization, storage of sterile supplies
    - Air flow from clean to soiled areas
    - Temperature and humidity per regulations

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Heating Ventilation Air Conditioning (HVAC) Role in Infection Prevention - 1

Air Exchange

- Dilutes contaminants
- Different rooms have different requirements air changes per hour (ACH)
  - Operating Rooms – 15 ach/hour
  - Airborne infectious isolation room – 12 ach/hour
  - Anesthesia Gas Storage – 8 ach/hour
  - Patient room – 6 ach/hour

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HVAC in Infection Prevention - 2

Filtration

- Removes particles from air
- MERV values (minimum efficiency reporting value)
  - higher the number, the greater the efficiency

Pressure Relationships (Positive or Negative)

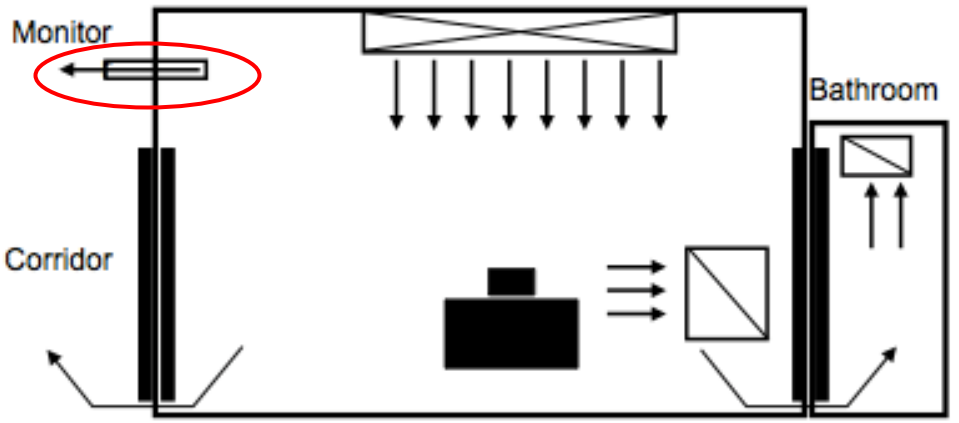
- Describes the movement of air between rooms
  - positive pressure = air moving out of a room
  - negative pressure = air moving in to a room

Care Areas Requiring Positive Air Pressure

Include

- Operating rooms
- C-Section suites
- Protective environments
  - e.g. Bone marrow transplant unit

Figure 2. Example of positive-pressure room control for protection from airborne environmental microbes (PE)* + §



CDC/HICPAC Guidelines for Environmental Infection Control in Healthcare Facilities, 2003 (pg 35)

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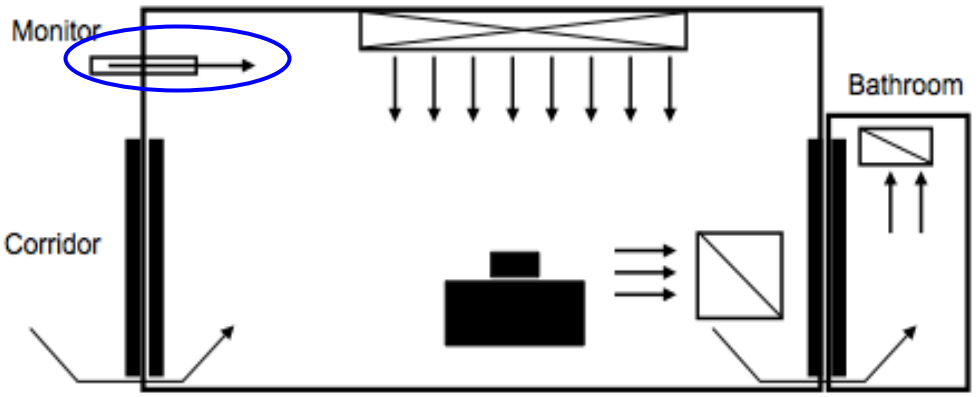
Care Areas Requiring Negative Air Pressure

Include

- Airborne infectious isolation rooms (AIIR)
- Areas where coughing may be induced
  - Bronchoscopy suite
  - Endoscopy suite
  - Sputum induction room

Figure 3. Example of negative-pressure room control for airborne infection isolation (AII)* + §¶



CDC/HICPAC Guidelines for Environmental Infection Control in Healthcare Facilities; 2003 (pg 36)

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HVAC Maintenance

Preventive maintenance

- Belts, filters and other moving parts should have scheduled inspection and maintenance
- Monitor for negative pressure daily when airborne infectious isolation rooms are in use
  - Establish policy and procedure
  - Document and report to ICC
  - Plan for when readings are not within desired range
- All patient care areas scheduled frequent inspections

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Water Systems and Infection Prevention

- Stagnant water allows formation of biofilms
  - Contain fungi, gram negative bacteria, legionella, other organisms
  - Infrequently used fixtures are more prone
- Flush and clean sinks, eyewash stations, ice machines regularly
- Do not use tap water to rinse semi-critical devices after disinfection
- Remove aerators from faucets
- Avoid decorative fountains/ waterfalls
- Monitor dialysis fluid and dialysate monthly
  - Pathogen limits are < 200 bacteria/ml for fluid
    < 2000 bacteria/ml dialysate)

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Flood Response

Policies and procedures should

- Define roles of multidisciplinary response team
  - Environmental Services
  - Maintenance/Engineering
  - Construction Company
  - Consulting Disciplines
  - Infection Prevention
  - Safety
- Define what constitutes a flood
- Identify first responders, escalation determinants, who reports to local public health, who determines when its safe to go back into affected space

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Infection Prevention During Construction

- Provisions must be made for protection of patients during any renovations or new construction
  - Generate moderate to high levels of dust
  - Vulnerable patents at infection risk from aerosolized organisms, e.g. aspergillosis
- Ensure facility-wide awareness of construction process
- Educate patient care staff on risks, mitigation strategies
- Mitigation strategies determined by
  1) Patient risk (as determined by care area)
  2) Construction activity level

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Infection Prevention during Construction - 2

Risk categories by patient care areas

Low Risk	Medium Risk	High Risk	Highest Risk
-Office Areas -Dining Hall	-Cardiology -Echocardiography -Endoscopy -Nuclear Medicine -Physical Therapy -Radiology -Respiratory. -Therapy	-CCU -Emergency Dept. -Labor & Delivery -Specimen Labs -Nursery -Outpatient Surgery -Pediatrics -Pharmacy -PACU -Surgical Units	-Burn -Cardiac Cath Lab -Sterile Central Supply -ICU -Medical Units -NPIR -Oncology -Operating Room -Any area caring for Immunocompromised

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Risk categories by construction activity type

Type A	**Non-Invasive Activities and Inspection** • Removal of ceiling tiles for visual inspection (limit 1 tile per 50 square feet) • Painting (but not sanding) • Wall covering, electrical trim work, minor plumbing, other activities that do not generate dust, require cutting of walls, nor accessing ceilings
Type B	**Small scale, short duration activities that create minimal dust** • Installation of telephone and computer cabling • Access to chase spaces • Cutting walls or ceiling where dust migration can be controlled
Type C	**Work that generates moderate to high levels of dust, requires demolition, or removes fixed building components or assemblies** • Sanding walls for painting or wall covering • Removal of floor coverings, ceiling tiles, and casework • New wall construction • Minor duct work, electrical work above ceilings, major cabling activities • Any activity that cannot be completed within a single work shift
Type D	**Major demolition and construction projects** • Activities that require consecutive work shifts • Require heavy demolition or removal of a complete cabling system • New construction

Class of mitigation activities determined by construction type and patient

Patient Risk Level	Construction Activity Type			
	Type A	Type B	Type C	Type D
Low	**I**	**II**	**II**	**III/IV**
Medium	**I**	**II**	**III**	**IV**
High	**I**	**II**	**III/IV**	**IV**
Highest	**II**	**III/IV**	**III/IV**	**IV**

Mitigation activities required for construction

Class I	1. Execute work to minimize raising dust from construction operations 2. Immediately replace ceiling tile displaced for visual inspection
Class II	1. Actively work to prevent airborne dust from dispersing into atmosphere 2. Seal unused doors with duct tape 3. Block off and seal air vents 4. Place dust mat at entrance and exit of work area 5. Remove or isolate HVAC system in areas where work is being performed.
Class III	1. Remove or Isolate HVAC system in area where work is being performed to prevent contamination of duct system 2. Before construction begins, complete all critical barriers, i.e. sheetrock, plywood, plastic, to seal area from non work areas –OR- implement control cube method, i.e. cart with plastic covering and sealed connection to work site, vacuuming with HEPA prior to exit 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units 4. Before transport, contain construction waste in tightly covered containers 5. Cover transport receptacles or carts. Tape covering unless solid lid.
Class IV	[continued on next page]

Mitigation activities required for construction

Class IV	1. Isolate HVAC where work is being done to prevent contamination of duct system. 2. Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. 3. Maintain negative air pressure within work site utilizing HEPA equipped air filtration units. 4. Seal holes, pipes, conduits, and punctures appropriately. 5. Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave the work site. 6. All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area. 7. Contain construction waste before transport in tightly covered containers. 8. Cover transport receptacles or carts. Tape covering unless solid lid. 9. Do not remove barriers from work area until completed project is inspected by the owner's Safety Department and Infection Control Department and thoroughly cleaned by the owner's Environmental Services Department

Infection Control Risk Assessment (ICRA) for Construction

- Develop risk assessment process to monitor and evaluate renovation and construction projects
- In policy, define responsibilities for assessment, monitoring, enforcement and evaluation of projects
  - Who keeps copies
  - Where will ICRA be filed (e.g., in Safety Dept)
- Report status to Infection Control Committee

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Environmental Assessment of Construction Area

For long-term projects

- Containment barriers made of fire-rated wallboard supported with stud frame
- All edges of construction area sealed
- Door installed so it opens into the work area
- Daily rounds by construction supervisor

Questions?

For more information, please contact any HAI Liaison Team member.

Thank you